Strategic Theme D: Infrastructure

Goal

The goal of Strategic Theme D is to improve the quality and efficiency of road infrastructure through the effective management of assets in accordance with user expectations and government requirements.

Overview

TC D5 met in Seattle to review the work by each Work Group, progress the upgrade of PIARC’s Tunnel Manual, advance arrangements for PIARC’s International Tunnels Conference in Lyon (Oct 2018) and to discuss key issues arising from related tunnel organisations.

30 May 2018

This meeting was hosted by the Washington State Department of Transport.

The following reports prepared by our Technical Committee in the previous cycle have been finalised and now published:

- Recommendations for sustainable road tunnel operations.
- Experience with significant incidents in road tunnels.
- Improving safety in road tunnels through real time communication.
- Road Tunnels: Complex Underground Road Networks.
- Monographs on complex underground road networks.
- Lay-bys and protection against lateral obstacles – situation in different countries.
- Design fire characteristics for road tunnels.

Our Technical Committee raised concerns about the insufficient time that is available to prepare technical reports in English, translate them to French and Spanish and then publish them. In response, the General Secretariat has agreed to publish the English version of technical reports without first reformatting them and translation. Reformatting of reports and their translation is expected to lag by approximately 6 months. Our Technical Committee is pleased with this decision as it will enable technical reports to be published within the cycle they are prepared which will improve their accessibility and use.

We were also informed that the General Secretariat has agreed to translate the Road Tunnels Manual in 12 languages.

Work Group Reports

Work Group 1 – Sustainable Operations

- Draft report on RAMS (Reliability, Availability, Maintainability, Safety) has been prepared and issued for peer review. The focus of this report is on maintenance and includes examples of the application of RAMS in several countries.
- Technical Watch report on LEDs in road tunnels has been prepared for the Routes/Roads magazine.
- Technical Report: First steps toward a sustainable operation, has been published.
- Completed review of reports from previous cycle.
Work Group 2 – Safety

- The main report that is being prepared will be titled, “Prevention and Mitigation of Tunnel Related Collisions”. The focus is on collisions within the influence of the tunnel operator. (fires are excluded as this topic has been well covered in other reports). A draft report is expected to be issued to all TC D5 members by September 2018, for review. Aim is to have a final draft report by March 2019.

  Development of this report has involved:
  - Input from 19 countries.
  - Interviews with tunnel operators in 11 countries.
  - Extensive literature review.

  Arrangements have been made for the draft report to be reviewed by TC C2 (Safety Committee).

- DG-RAM

  Users have requested an upgrade of the software. The upgrade is being developed in two phases, as follows:
  1. Update of the tool to make it compatible with existing software.
  2. Improvements to the model.

  DG-RAM will be available by download or on CD-ROM. Training courses for experienced users and for novice users will be arranged. The required budget for Phase 2 has not been determined at this time.

Work Group 3 – Human Factors and ITS

- The main technical report will be titled, “General Principles to Improve Accessibility for Reduced Mobility Users”. Have prepared case studies based on the experience of 12 countries. A draft report will soon be issued to all TC D5 members for review.

- A paper on ITS in-road tunnels is almost complete. It will include several key issues that will need further consideration in the next cycle.

- An article has been prepared on provision for persons with reduced mobility during a tunnel incident and is expected to be published in PIARC’s Routes/Roads magazine in September 2018.

- A paper on public address systems for road tunnels is at final draft version and is expected to be published in July/August 2018.

Work Group 4 – Vehicle Emissions

- The main technical report has been prepared as a final draft version and is currently under review. The report is expected to be published by 2019 and will replace the current PIARC report on vehicle emissions.

- An article for PIARC’s Routes/Roads magazine is being prepared.

Work Group 5 – Large Underground Infrastructure

- Inconsistent Work Group member attendance at meetings is restricting progress of the main technical report.

- Currently reviewing case studies prepared in a previous cycle. Intending to update attachments to case studies.

- A report on ventilation is expected to be prepared by late 2018.

Work Group 6 – Knowledge Management

Aim is to have the updated Road Tunnels Manual in English published by the next World Road Congress in Abu Dhabi in October 2019. The Committee has a significant workload in order to have the manual updated in this time period.
31 May 2018

The Committee was updated on liaison with other organisations.

**ITA – COSUF** (Committee on Operational Safety of Underground Facilities)

This Committee produces guidelines which are available on its website ([www.ITA.COSUF.org](http://www.ITA.COSUF.org)). It also conducts workshops, such as Tunnel Safety Officers Forum. Several nations have Tunnel Safety Officers (varies from one to many officers per nation, depending on the number of tunnels in a nation). Spain has recently initiated a meeting of tunnel safety personnel with the intention of establishing Safety Officers.

The Committee is currently considering risks presented by vehicles with alternative fuels and possible mitigations. Fire departments are seeking more information on the risks of vehicles with alternative fuels. Our Technical Committee intends to co-operate with the ITA-COSUF Committee on this topic. In the Netherlands, all buses will soon be powered by hydrogen which presents significant risks that need to be better understood.

**European Commission Committee on Road Tunnel Safety**

This Committee has 28 European members. Its main objective is to achieve zero deaths and serious injuries by 2050. It is currently considering new safety measures and is reviewing safety legislation. Crashes mainly occur in the vicinity of tunnel portal areas. Road Safety Auditors will be engaged to review these areas to try and identify measures that would improve safety. The EU is preparing a standard template to report incidents in tunnels. (Austroads could consider the template when it becomes available, for possible use across ANZ).

**CIE** (International Commission on Illumination)

CIE 88:2004, Guide for the lighting of road tunnels and underpasses has been updated. Some nations are beginning to use coloured lighting in tunnels. This Commission is considering the benefits and dis-benefits of this application in tunnels.

**IES** (Illumination Engineering Society)

LED lighting has been developed where the light intensity adapts to traffic volume, traffic speed, vehicle types and external weather conditions.

**NFPA** (National Fire Protection Association)

NFPA standards are not binding unless a jurisdiction adopts them. These standards are adopted by almost all States in USA.

The Association has recently discovered that water ingress into passive fire protection boards can cause extensive delamination and collapse. This is based on experience of some tunnels in the UK. In some cases, water ingress increased the weight of panels up to 40% compared to their weight when first installed. Important to assess the water absorption characteristics of boards. There are various tests that can be used for such assessment.

Several nations have had similar failure experiences with fire protection boards. Some nations are avoiding the use of fire protection boards, preferring to use sprayed fibre reinforced concrete or other treatments.

**CENELEC**

Currently there is no EU standard for air quality sensors in tunnels. A Working Group has been formed to develop a standard. Proposed title of the standard is, "General performance requirements and test methods for gaseous and airborne pollution measurements in tunnels". The new standard is expected to be developed by early 2019. Visibility will be a characteristic covered by the new standard.
1 June 2018

We inspected the tunnel in Seattle that will replace the Alaskan Way Viaduct. The bored tunnel is approximately 20m in diameter (one of the largest in the world) and approximately 3km long. It has two levels, one level for each direction of traffic. The tunnel is expected to be operational in the next 3 – 6 months. Replacement of the Alaskan Way Viaduct with the new tunnel will transform the port area significantly improving amenity and safety.

Key Learnings

- Norway has established a Tunnel Safety Cluster to work on various topics. The cluster is facilitating meetings across the world to identify best practices. Australia (Austroads) can participate in this cluster.
- Norway has established a Tunnel Safety Centre to provide a training environment for fire fighters.
- In the EU, public address systems must be used in tunnels longer than 500m. However, public address systems are not mandatory in all countries. ISO specifies the standards for public address systems.
- The use of Tunnel Safety Officers is becoming more common across the world. Austria has made some use of rapid incident detection in tunnels through acoustic monitoring. The system can detect anomalies of noise within a tunnel. Operational systems can take more than 10 minutes to detect incidents, whereas an acoustic monitoring system can detect an incident in less than one second. This system can be coupled with automated incident detection cameras. Over the last eight years, no maintenance of the microphones has been required. There have been no microphone failures and a very low false alarm rate. Microphone spacing is approximately 100m. It takes approximately 3 – 6 months to calibrate the system. The cost of the system is about 100,000 Euros/km.

George Mavroyeni
Technical Director, Independent Reviewer
AECOM Australia Pty Ltd
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